Appl. No. 09/822,586
Amendment dated Jan. 24, 2005
Reply to Non-Final Office Action of Sept. 23, 2004

.REMARKS/ARGUMENT

The Examiner has rejected claims 1-28 under Section 103(a) as being unpatentable primarily over U.S. Patent No. 5,982,915 to Doi et al. (herein referred to as the "Doi patent") in combination with U.S. Patent No. 6,075,905 to Herman et al. (herein referred to as the "Herman patent").

Applicants have herein cancelled claims 1-28 and replaced them with claims 29-56. Applicants respectfully submit that the new claims are allowable over the cited references. The claims are fully supported by the specification, and no new matter has been added. For example, the subject matter in claims 29, 39, and 49 is fully described, e.g., at page 3, lines 12-19, lines 20-27. Support for claims 30, 40, and 50 can be found at page 14, line 17 to page 15, line 21.

Section 103

As explicitly set forth in independent claims 29, 39, and 49, the present invention is directed to a method for "blind registration" of images. The Doi patent, on the other hand, is an example of a "feature-based" registration technique. As indicated in the background section of the present application, there are in general two prior art approaches to image registration: *"feature-based"* registration and *"blind"* registration. See Specification at pages 1-2. As discussed in the Specification:

> Feature-based registration attempts to identify edges, corner points,
> contours, or other features that are common to two images, and then uses
> standard geometric transforms to compute the mapping between the pairs.
> ... [F]eature-based registration is mainly concerned with locating features
> common to both images, and rejecting features that are exclusive to one
> image.

Specification at page 1, lines 17-25.

The Doi patent is an example of a "feature-based" registration technique. It depends specifically on the identification of common features to match the two images, in particular, on

the identification of rib cage edges (see Doi patent, col. 5, lines 37-40, col. 6, lines 23-34). The Doi patent uses segmentation in order to limit processing to specific areas inside the rib cage (see col. 6, lines 23-34). In addition, the Doi patent, in the context of the warping step (step 118 in FIG. 1), requires the selection of what are referred to as "regions of interest (ROIs)" which are locally matched in order to improve the registration results. This requires pre-identification of interesting anatomical features within the rib cages in order to improve matching results. (see col. 7, lines 4-36).

Accordingly, the Doi patent does not disclose "blind" registration of images, since it depends on the identification of specific features for alignment. Nor does the Doi patent disclose using normalized correlation "expressed as vector correlations computed in the Fourier domain." Nor does the Doi patent disclose using "nonlinear pre-filtering and thresholding" to "enhance[e] cross-spectral correlation between the first and second images". The Doi patent, as a limited feature-based registration technique is not designed to handle the problems as described in the specification with cross-spectral image details (see Specification at page 1, line 17 to page 2, line 5).

The Herman patent (or any of the other references cited by the Examiner with respect to the dependent claims) does not remedy the shortcomings of the Doi patent. The Herman patent is directed to mosaic image construction, i.e., the processing of a variety of images that are aligned and merged into a larger image mosaic. Again, the Herman patent is directed to a different form of image processing, in which the first and second images are assumed to have similar spectral characteristics—otherwise, the images are incapable of forming a seamless mosaic. The present invention, on other hand, is applicable to cross-spectral images, e.g., where one image is in the visible spectrum and where the second image is of the same area in the infrared spectrum.

Accordingly, the Herman patent does not disclose using "nonlinear pre-filtering and thresholding" to "enhance[e] cross-spectral correlation between the first and second images". Nor does it disclose "blind registration" using normalized correlation "expressed as vector correlations computed in the Fourier domain."

Moreover, there is no motivation to combine the Doi patent and the Herman patent. The Doi patent is primarily directed to enhancing detection of temporal-based changes in an image of
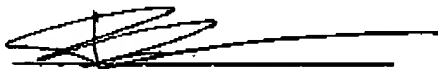
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patient's chest. The Herman patent is directed to aligning and merging images all presumably taken at around the same time in order to form a larger mosaic. The problems addressed by the two patents are different in scope and character.

Conclusion

Applicants respectfully submit that claims 29-56 represent patentable subject matter and that the application is now in condition for allowance. If the Examiner has any questions, please feel free to contact the undersigned at 609 951-2522. Authorization is hereby given to charge any fees which may be required, except the issue fee, to Deposit Account 14-0627.

Respectfully submitted,

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